

Belarus

Country Profile

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1. Overview of Electricity Supply

Over the past few years, Belarus has made many updates to reduce energy consumption and increase energy effectiveness. These upgrades were possible partly from the country's increase of collection rates, from 45 percent in 2002 to 92 percent in 2005. An investment of \$431 million and \$522 million was put into the energy sector in 2004 and 2005, respectively. With these investments, upgrades have been made on many of their current power stations (National Legal Portal, 2009).

Existing infrastructure and geographic proximity to Russia ensure that Russia will be Belarus' primary source of energy for the foreseeable future. Due to Belarus' past loyalties to Russia, Belarus enjoyed Russian gas import prices well below those charged to Eastern and Western Europe for many years. Western Europe was paying approximately \$230 per thousand cubic meters (tcm), most eastern European countries were paying around \$110-\$120 per tcm, and Belarus was paying \$47 per tcm. In 2006, Russia told Belarus to either sell half of their state-owned pipeline operator, or Russia would increase the price of gas from \$47 per tcm to \$200 per tcm. After discussions, the agreement was for Russian gas to be sold to Belarus at \$100 per tcm and for Belarus to sell half of the pipeline operator, Beltransgaz, to Russia. This was a large change for Belarus as they consumed 21.7 billion cubic meters of natural gas in 2007.

Summary information about Belarus is located in the following table.

Demographical Information	
Population, millions (2009)	9.65
Land area, thousand sq km (2009)	207.6
Macroeconomic Information (2008)	
GDP, billion US\$	114.1
Real GDP growth rate, percent	9.2
Foreign direct investment (net), million US\$ (2007)	1,769
Electricity disposition, billion kWh (2006)	
Generation	29.91
Consumption	30.43
Exports	5.79
Imports	10.15
Generation capacity, GW (2005)	
Nuclear	0.00
Thermal	8.01
Hydro	0.01
Other renewables	0.00
Total	8.02
<i>Sources: CIA World Factbook, U.S. Energy Information Administration, United Nations Conference on Trade and Development.</i>	

Belarus Country Summary Table

Belarus is poorly endowed with hydrocarbon resources. In the past few years, the hydrocarbon supply only met approximately seven percent of the energy demand. However, Belarus does have significant wood stock and peat deposits as well as potential for small hydropower. In order to develop small biomass and hydropower, policies would need to be put in place such as subsidies, regulatory framework and legislation.

Privatization has slowly advanced since the split from the Former Soviet Union. According to the five-year economic development plan adopted in May 2002, the state will continue to play a dominant role in the economy. At the end of 2008, the economy minister of Belarus stated the plans to sell up to 600 companies within the next three years; however, the poor state of the economy in 2009 does not have private investors very interested in the risk.

The country's power grid is connected to the grids of Lithuania, Russia, and Ukraine. Most electricity imports come from Lithuania (the Ignalina Nuclear Power Plant) and Russia (the Smolensk Nuclear Power Plant). The first of the two reactors at Ignalina nuclear plant was closed in 2005, and the second reactor is set for closure in 2009. Once the second reactor is closed, imports from Lithuania will not be possible.

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2. Energy Policy, Barriers and Incentives

In February 2006, Belarus approved an energy saving program for 2006-2010. The program promotes

- Centralized management of all stages of production and the transportation of energy carriers.
- State tariffs on electric and thermal energy.

- Renovation and development of generating sources.
- Development and control of energy conservation programs stimulating the application of energy efficient technologies and equipment to all branches of the economy.
- Cost reduction of supply, transportation and consumption of all types of fuels.
- Gradual diversification of suppliers of different types of fuel to Belarus.
- Involvement of an economic amount of local fuels and renewables.

By promoting the use of local, waste, and renewable energy resources, Belarus plans to displace 1.7 million equivalent tons of fuel. The objective to utilize modern energy saving technologies is planned to save at least 7.7 million equivalent tons of fuel.

In May 2009, the Deputy Chairman of the State Standardization Committee of Belarus – director of the energy efficiency department told mass media about Belarus' plans to become more energy efficient. He claimed by 2012, at least 25 percent of electric and heat energy will be produced from local and alternative fuels. He also stated that by 2010, the energy consumption of the country's GDP will be reduced by 31 percent. These goals, he said, are only to be achieved with foreign investment and support (National Legal Portal, 2009).

Additional energy policy, barriers and incentives include:

- All renewables – unwillingness of state companies to invest in new technologies.
- All renewables – Belarusian government has been known to finance projects on a gratuitous basis only.
- Wind - In 1994 Belarus introduced a standard feed-in tariff for renewable generated electricity in a law modeled on Germany's Electricity Feed Law, a fixed feed-in tariff of USD 0.08/kWh.
- Solar - The climate is not favorable for the application of any large scale plants.

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3. Wind

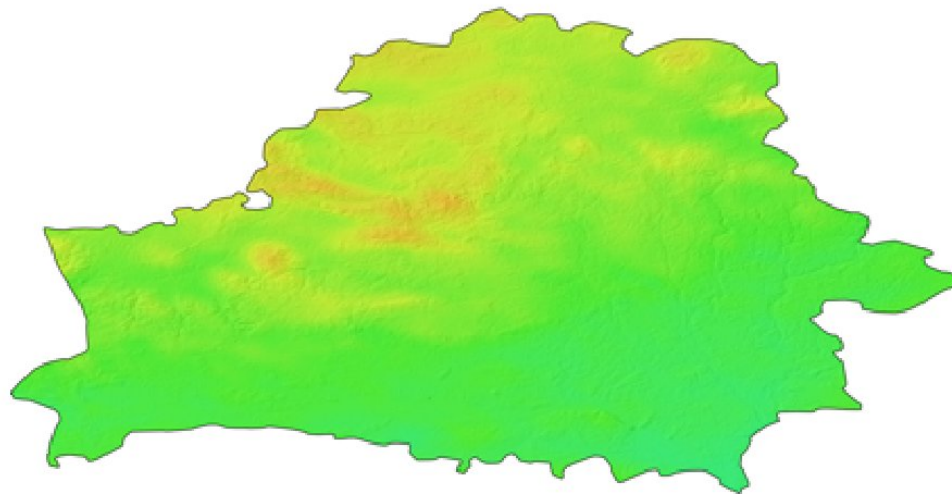
In 2006, 1 million kWh of electricity was produced by Armenian wind farms. There are currently two wind farms in Belarus. The Drushnaja wind farm has a total installed power of 0.85 MW, and it produces approximately 1 GWh of power annually. The farm supplies an estimated 700 habitants, and it is located in the western portion of the country (Wind Power, 2009).

The Minsk wind farm has a capacity of 1,080 kW and an estimated yearly production of 2 GWh. Located in the central part of the state, this wind farm is able to provide 900 habitants with electricity (Wind Power, 2009).

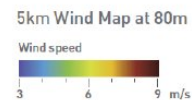
The wind speed in the Dzerzhinsk region averages 8.6 m/s. Belarus has had several potential wind farm projects, yet none have started construction. A majority of the country, according to the map below, has wind velocities of about 5 m/s at a height of 80 m.

Wind Atlas of Belarus (Source: 3Tier)

Belarus Wind Map at 80m



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4. Biomass

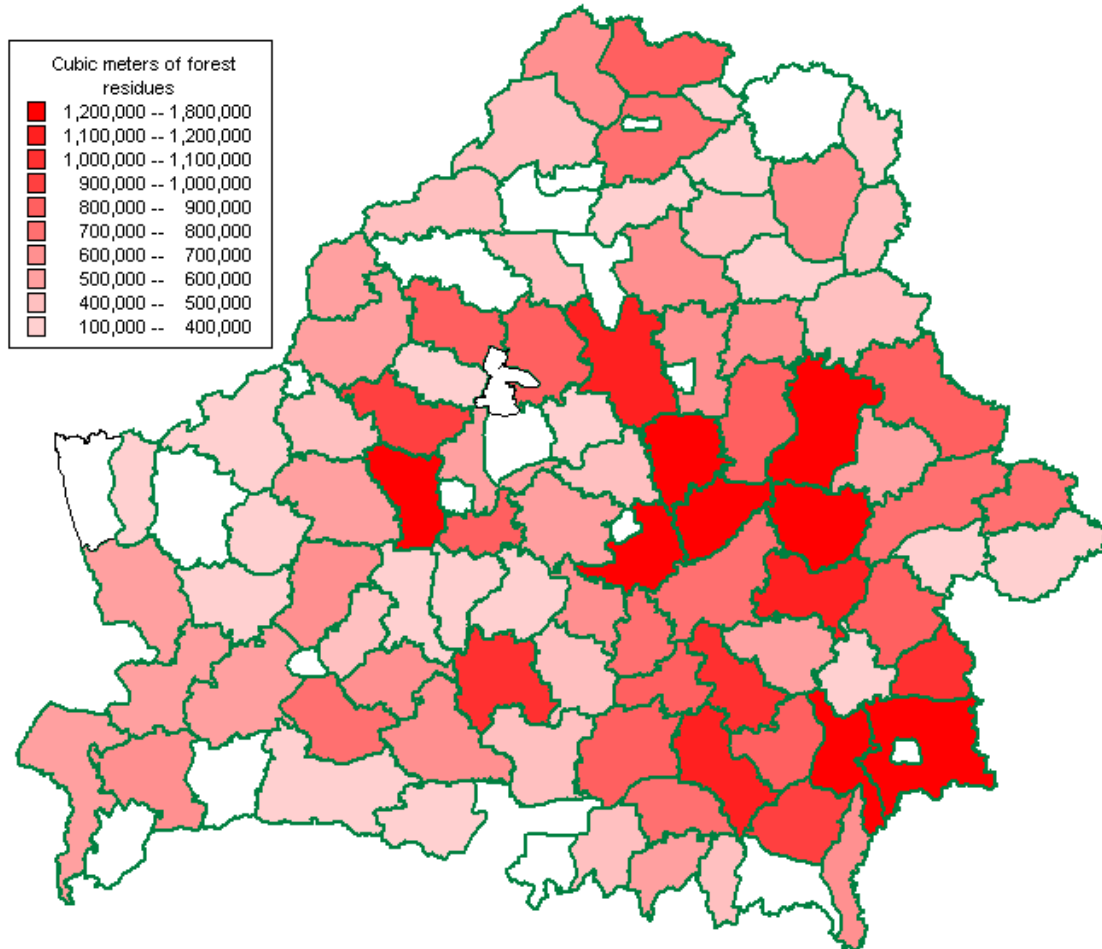
The most significant renewable energy source in Belarus is wood. Annually, approximately 13 million m³ of wood is harvested, and 6.5 million m³ are used in biomass applications. A large range of water-heating boilers with capacity from 60 to 5,000 kW utilize wood fuels in Belarus. In 2007 20 million kWh of electricity was produced from biomass and waste.

In May 2009 the World Bank approved a \$125 million loan for Belarus to improve the energy effectiveness in heating energy and electricity manufacturing in some cities. The main goal of the project is to convert existing heating boilers into cogeneration plants in several Belarusian towns. The conversion should provide approximately 90 MW of additional electric power (National Legal Portal, 2009).

Belarus is very well suited for biomass energy development due to large area of productive industrial forest, flat landscape, well developed power distribution and

district heating infrastructure, and technically adept society. The map below displays the availability of forest residues throughout Belarus.

Availability of Forest Residues in Belarus



Biogas obtained from animal husbandry wastes is another renewable energy source in Belarus. In 1992 the first biogas plant “Kobos” was commissioned in Republic. It was designed and manufactured similar to West European plants. Its productivity is made up of 500 m³ of biogas a day with 50 m³/day of cattle manure.

According to a report by ENECA, wood fuel and waste have the potential to create 4.6 million t.o.e. Biomass could produce 1.13 million t.o.e., and municipal waste could potentially produce 0.329 million t.o.e (Pospelova, 2006). The following table displays information about the use of land in Belarus.

Biomass resource type	Total production	Production density
Total land area covered by	(avg. 2006–2007, km ²)	(avg. 2006–2007, %)
Arable Land	5,810	20
Permanent Crops	1,205	4
Permanent Meadows and Pastures	4,180	15
Forest Area	8,015	28
Other Land	8,190	29
Inland Water	1,350	5
Primary crop production, tonne	(avg. 2006–2007, tonne)	(tonne / 100 km ²)
Total primary crops (rank among COO)	21,976,513 (22)	10,586 (21)
Top 10 primary crops		
Potatoes	8,536,706	4,112
Sugar Beet	3,802,143	1,832
Barley	1,871,153	901
Wheat	1,236,194	59
Rye	1,188,531	573
Triticale	1,110,133	535
Oats	567,436	273
Cabbages & other brassicas	565,792	273
Vegetables fresh nes	508,375	245
Apples	381,993	184
Animal units, number	(avg. 2006–2007, number)	(number / 100 km ²)
Cattle	3,984,550	1,919
Poultry	28,600,000	13,777
Pigs	3,593,450	1,731
Equivalent animal units	5,707,930	2,749
Annual roundwood production	(2006–2007, m ³)	(m ³ / 100 km ²)
Total	8,756,100	4,343
Fuel	1,345,000	667
Industrial	4,629,100	2,296
Wood-based panels	710,000	352
	(2006–2007, tonne)	(tonne / 100 km ²)
Paper and paperboard	285,000	137
Recovered paper	0	0

Source: Food and Agriculture Organization of the United Nations

Belarus Biomass Resource Data

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5. Solar

At present the use of solar power is minimal. As of 2007, solar power has not contributed to the electricity generation of Belarus. There are only a few example applications of solar water-heating plants using flat-plate solar collectors.

The climate conditions in Belarus are on the whole unfavorable for solar energy. The relatively poor potential is characterized by the data below for Minsk, the capital, and Vasilevichi, located in the Southeast of the country. The main opportunity for solar applications is the use of flat modules, including flat thermal collectors, flat photovoltaic arrays, and is most practical in the summer time.

Location	Minsk	Vasilevichi
Jan	69	86
Feb	133	145
Mar	291	295
Apr	393	402
May	567	570
Jun	624	623
Jul	590	613
Aug	478	505
Sep	315	344
Oct	154	176
Nov	59	71
Dec	41	52
Yearly	3714	3882

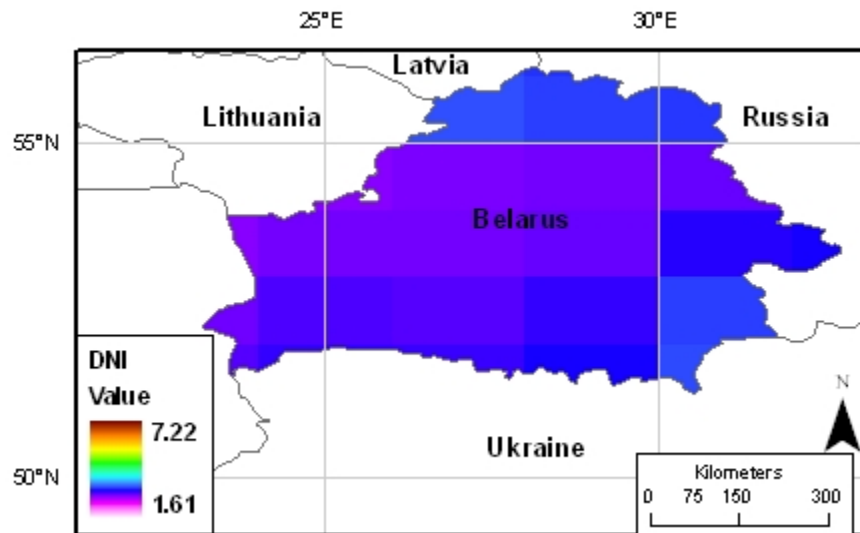
Monthly and annual total solar radiation incident on horizontal surface, MJ/m²

Location	Minsk	Vasilevichi
Jan	83	93
Feb	127	140
Mar	293	257
Apr	325	299
May	467	452
Jun	531	509
Jul	483	462
Aug	415	424
Sep	307	330
Oct	160	179
Nov	56	67
Dec	44	43

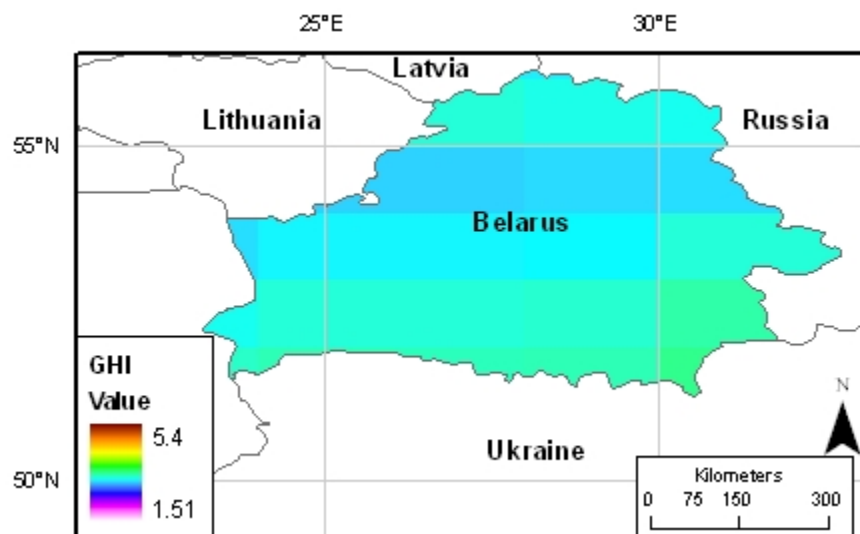
Monthly and annual direct solar radiation incident on surface normal to sunlight beams, MJ/m²

The figures below show the global horizontal irradiation and direct normal irradiation values for Belarus. As shown, Belarus does not have favorable conditions for the implementation of solar power.

Direct Normal Irradiation Map (Source: NASA)



Global Horizontal Irradiation Map (Source: NASA)



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6. Geothermal

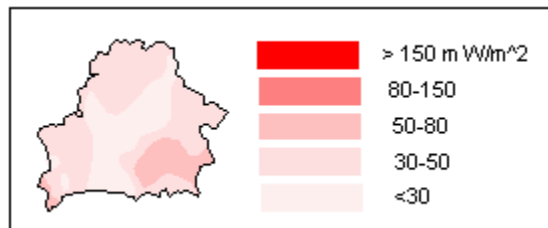
Belarus is characterized mainly by low to moderate values of geothermal gradient. Despite a large number of non productive prospecting oil wells, thermal water is not used for electricity generation.

The territory of Belarus belongs to the Precambrian East-European Platform, such areas are usually rather cold and there are no high-enthalpy geothermal steam reservoirs useful for electricity production. Geothermal water and brines in Belarus have temperatures from 10°C at depths around 200-500 meters within the Belarussian Antecline and the Orsha Depression to 80-110 °C at depths of 4-5.5 km in the south-eastern part of Belarus. Their higher values are typical for the Brest Depression and the Pripyat Trough. Heat flow density for the territory ranges from below 20-30 mW/m² for Precambrian units (the Belarussian Antecline, Orsha Depression, the Latvian, Polessian and Zhlobin saddles) to 70- 80 mW/m² within the northern part of the Pripyat Trough. Fields with high temperature thermal water are absent in Belarus.

The most promising areas for geothermal energy utilization are the Pripyat Trough and the Brest Depression both in the southeastern part of Belarus, where many deep boreholes were drilled. As of December 2004, only one small heating installation in the northeastern central part of Belarus is operational with a total capacity of 0.5 MWt and an annual energy output of 10 TJ. Several small heat pump systems for heating waterworks and sewage header buildings are operational in five locations. These pumps have an installed capacity of 0.5 MWt, and an estimated annual energy output of 3.3 TJ. Thus, the total installed geothermal capacity in Belarus is 1 MWt, and the total estimated annual energy output is 13.3 TJ.

The geothermal heat-flow density for Belarus is displayed below.

Geothermal Heat Flow Density for Belarus
(Source: Energie-Atlas GmbH)



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7. Hydroelectric

The hydro resources in Belarus are rather scarce, but there is potential for small hydropower generation plants in the Northern and Central parts of the Republic. In particular, interested Austrian companies determined there to be some potential for hydropower in Belarus in 2009: a 200 MW station on the Dnieper river, an 80 MW station on the Nieman and an 100 MW station on the Western Dvina (National Legal Portal, May 2009).

A new 150 kWh hydropower plant was commissioned in January 2007 at the Soligorsk storage lake. The oblast now has six hydropower plants totaling 2,150 kWh of capacity (National Legal Portal, Aug. 2007). In 2007 hydroelectric plants in Belarus produced 24 million kWh of electricity.

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8. Relevant Links

Please see webpage for links to relevant pages.

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9. References

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10. Country Contacts

Contacts made in the preparation of this assessment are gratefully thanked for their contribution to this report. Please see webpage for contact listing.

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